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### UNIT 1, SECTION III TEST REVIEW (Lessons 11-16)

This review sheet contains sample questions for each of the lessons on the test. It does not cover all information. For a complete review of material for the test, please consult your outlines, textbook, homework assignments, and classwork worksheets. Be sure to know all the key terms for each lesson.

#### Lesson 11: Models of the Atom

1. Know the definitions for: atom, atomic theory, model, nucleus, proton, neutron, & electron
2. a) What did JJ Thomson do in his experiment? b) Which subatomic particle did he discover?  
c) Sketch a picture of his model and label the main features. d) What is his model named?
3. a) What did Neils Bohr do in his experiment? b) Sketch a picture of his model and label the main features. c) What is his model named?
4. Sketch and label the simple atomic model that is used today.

#### Lesson 12: Atomic Number and Atomic Mass

5. What is the definition of atomic number?
6. Name the element:  
a. atomic number 6 \_\_\_\_\_ b. contains 8 protons \_\_\_\_\_  
c. atomic number 40 \_\_\_\_\_ d. contains 80 protons \_\_\_\_\_
7. Name the atomic number:  
a. copper: \_\_\_\_\_ b. lithium \_\_\_\_\_ c. neon \_\_\_\_\_
8. Which subatomic particles contribute to an atom's mass? What is the mass in amu of each one?

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9. How many atomic mass units (amu) is:

a. an atom containing 8 protons and 9 neutrons?

b. the most common isotope of sodium, Na?

10. a. What is the average atomic mass listed on the periodic table for lithium? (Include all decimals)

b. What is the most common isotope of lithium: lithium-6 or lithium-7. Why?

### **Lesson 13: Isotopes**

11. Know the definitions for: isotope, mass number, average atomic mass

12. Silver exists as two isotopes. The first isotope of silver has a mass of 106.91 amu and its abundance is 51.84%. The second isotope of silver has a mass of 108.90 amu and its abundance is 48.16%. Calculate its average atomic mass.

13. Write the isotope name and isotope symbol for each of the following:

a. an atom with 7 protons and 8 neutrons.

b. an atom with 35 protons and a mass number of 90.

### **Lesson 14: Stable and Radioactive Isotopes**

14. Are radioactive isotopes stable or unstable? Why?

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15. Use the graph on page 68 to answer the following questions.

- What do the numbers on the x-axis represent?
- What do the numbers on the y-axis represent?
- Adding protons and neutrons provides the \_\_\_\_\_ of an atom.
- How many stable isotopes does an atom of bromine have?
- How many radioactive isotopes does an atom of zirconium have?
- Is an atom containing 38 protons and 46 neutrons stable or unstable?
- Provide the *isotope name* and *isotope symbol* for two isotopes with the same number of protons.
- Provide the *isotope name* and *isotope symbol* for two isotopes with the same number of neutrons.

16. Complete the following table: (Use the periodic table for atomic numbers and element names/symbols only. Remember the mass on the periodic table is a weighted average atomic mass for all isotopes of an element.... whereas this table is referring to a single atom of an element. Therefore, the atomic mass given on the periodic table should not be used to complete this chart!)

Isotope Name	Isotope symbol	Atomic #	# of Protons	# of Neutrons	Mass #	# of Electrons
<b>thallium-200</b>						81
	$^{137}_{56}\text{Ba}$					
		<b>83</b>		<b>126</b>		
			<b>48</b>		<b>113</b>	

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**Lesson 15: Nuclear Reactions and Lesson 16: Formation of Elements**

17. Know the definitions for: nuclear reaction, radioactive decay, alpha decay, alpha particle, beta decay, beta particle, radiation, gamma ray, fission, fusion, half-life

18. Write a nuclear equation showing each of the following isotopes emitting a beta particle.

a. potassium-42

b. iodine-131

c. iron-52

d. sodium-24

19. Which of the daughter isotopes from Question 18 are stable? (Consult the graph on page 68).

20. Write a nuclear equation showing each of the following isotopes emitting an alpha particle.

a. platinum-175

b. gadolinium-149

c. americium-241

d. thorium-232

21. Which of the daughter isotopes from Question 20 are stable? (Consult the graph on page 68).

22. a. What are the symbols for alpha, beta, and gamma radiation?

b. Which is the most harmful and why?

c. Gamma radiation often accompanies the processes of: *Circle all that apply*

i. alpha decay

iii. fission

ii. beta decay

iv. fusion

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23. The splitting apart of a nucleus is called \_\_\_\_\_. Where does this process occur?

24. The joining of nuclei to form a larger nucleus is called \_\_\_\_\_. Where does this process occur?

25. Where do nuclear reactions take place in an atom?

26. Suppose bohrium-272 undergoes beta decay. The daughter isotope then also undergoes beta decay. What is the final product?

27. The only way to change one element into another is to change the number of \_\_\_\_\_ in the nucleus.

28. Write a nuclear equation for the formation of iron-54 through fusion.

29. Read **two** of the following excerpts and summarize them below:

*Option 1: History Connection, p. 74*

*Option 2: Career Connection, p. 75*

*Option 3: Career Connection, p. 76*

*Option 4: Health Connection, p. 76*

*Option 5: Astronomy Connection, p. 81*

*Option 6: Consumer Connection, p. 81*

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#### Lesson 11: Models of the Atom

1. Know the definitions for: atom, atomic theory, model, nucleus, proton, neutron, & electron
2. a) What did JJ Thomson do in his experiment? b) Which subatomic particle did he discover?  
c) Sketch a picture of his model and label the main features. d) What is his model named?  
a) Zapped atoms with electricity and noticed negatively charged particles were removed.  
b) Discovered electrons.  
c) negative electrons floating in a positive fluid.  
d) plum pudding model
3. a) What did Neils Bohr do in his experiment? b) Sketch a picture of his model and label the main features. c) What is his model named?  
a. Exposed elements to flame/electric fields and observed only certain colors of light given off  
b.  
  
c. solar system model
4. Sketch and label the simple atomic model that is used today.

#### Lesson 12: Atomic Number and Atomic Mass

5. What is the definition of atomic number? # of protons in nucleus of an atom
6. Name the element:  
a. atomic number 6 carbon b. contains 8 protons oxygen  
c. atomic number 40 zirconium d. contains 80 protons mercury
7. Name the atomic number:  
a. copper: 29 b. lithium 3 c. neon 10
8. Which subatomic particles contribute to an atom's mass? What is the mass in amu of each one?  
protons (1 amu) and neutrons (1 amu)

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9. How many atomic mass units (amu) is:

a. an atom containing 8 protons and 9 neutrons?

8 protons = 8 amu

9 neutrons = 9 amu

8 amu + 9 amu = **17 amu**

b. the most common isotope of sodium, Na?

The most common isotope of sodium is sodium-23 because the average atomic mass on the periodic table is closest to 23. The atomic mass of sodium-23 is

**23 amu**

10. a. What is the average atomic mass listed on the periodic table for lithium? (Include all decimals)

**6.941 amu**

b. What is the most common isotope of lithium: lithium-6 or lithium-7. Why?

The average atomic mass on the periodic table is a weighted average and lithium's average is closer to 7 than 6 so the most common isotope of lithium is lithium-7.

### Lesson 13: Isotopes

11. Know the definitions for: isotope, mass number, average atomic mass

12. Silver exists as two isotopes. The first isotope of silver has a mass of 106.91 amu and its abundance is 51.84%. The second isotope of silver has a mass of 108.90 amu and its abundance is 48.16%. Calculate its average atomic mass.

$$\text{average atomic mass} = \frac{(106.91 \times 51.84) + (108.90 \times 48.16)}{100} = \mathbf{107.87 \text{ amu}}$$

13. Write the isotope name and isotope symbol for each of the following:

a. an atom with 7 protons and 8 neutrons.

nitrogen-15



b. an atom with 35 protons and a mass number of 90.

bromine-90



### Lesson 14: Stable and Radioactive Isotopes

14. Are radioactive isotopes stable or unstable? Why?

Radioactive isotopes are unstable. They do not have a stable ratio of neutrons to protons in their nuclei. There are too many positive protons repelling in the nucleus and no amount of neutrons can hold them in. Therefore, the nucleus will undergo radioactive decay.

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15. Use the graph on page 68 to answer the following questions.

- What do the numbers on the x-axis represent? **protons in the isotope**
- What do the numbers on the y-axis represent? **neutrons in the isotope**
- Adding protons and neutrons provides the **mass # or mass** of an atom.
- How many stable isotopes does an atom of bromine have? **2**
- How many radioactive isotopes does an atom of zirconium have? **2**
- Is an atom containing 38 protons and 46 neutrons stable or unstable? **Stable, pink square on the graph**
- Provide the *isotope name* and *isotope symbol* for two isotopes with the same number of protons.  
**Answers will vary but both isotopes should be the same element.  
Answer needs to have both isotope name and isotope symbol.**
- Provide the *isotope name* and *isotope symbol* for two isotopes with the same number of neutrons.  
**Answers will vary. Must have both isotope name and isotope symbol.**

16. Complete the following table: (Use the periodic table for atomic numbers and element names/symbols only. Remember the mass on the periodic table is a weighted average atomic mass for all isotopes of an element.... whereas this table is referring to a single atom of an element. Therefore, the atomic mass given on the periodic table should not be used to complete this chart!)

Isotope Name	Isotope symbol	Atomic #	# of Protons	# of Neutrons	Mass #	# of Electrons
<b>thallium-200</b>	<b><sup>200</sup><sub>81</sub>Tl</b>	<b>81</b>	<b>81</b>	<b>119</b>	<b>200</b>	<b>81</b>
<b>barium-137</b>	<sup>137</sup> <sub>56</sub> Ba	<b>56</b>	<b>56</b>	<b>81</b>	<b>137</b>	<b>56</b>
<b>bismuth-209</b>	<b><sup>209</sup><sub>83</sub>Bi</b>	<b>83</b>	<b>83</b>	<b>126</b>	<b>209</b>	<b>83</b>
<b>cadmium-113</b>	<b><sup>113</sup><sub>48</sub>Cd</b>	<b>48</b>	<b>48</b>	<b>65</b>	<b>113</b>	<b>48</b>



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**Lesson 15: Nuclear Reactions and Lesson 16: Formation of Elements**

17. Know the definitions for: nuclear reaction, radioactive decay, alpha decay, alpha particle, beta decay, beta particle, radiation, gamma ray, fission, fusion, half-life

18. Write a nuclear equation showing each of the following isotopes emitting a beta particle.

a. potassium-42 *These are homework questions from Lesson 15, pg. 78, reviewed in class.*

b. iodine-131

c. iron-52

d. sodium-24

19. Which of the daughter isotopes from Question 18 are stable? (Consult the graph on page 68).

*a, b, c*

20. Write a nuclear equation showing each of the following isotopes emitting an alpha particle.

a. platinum-175 *These are homework questions from Lesson 15, pg. 78, reviewed in class.*

b. gadolinium-149

c. americium-241

d. thorium-232

21. Which of the daughter isotopes from Question 20 are stable? (Consult the graph on page 68).

*a, b, c*

22. a. What are the symbols for alpha, beta, and gamma radiation?

$\gamma$

b. Which is the most harmful and why?

*gamma, highest energy*

c. Gamma radiation often accompanies the processes of: *Circle all that apply*

i. alpha decay

iii. fission

*alpha, beta, fission*

ii. beta decay

iv. fusion

Name:

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23. The splitting apart of a nucleus is called \_\_\_\_\_. Where does this process occur?

24. The joining of nuclei to form a larger nucleus is called \_\_\_\_\_. Where does this process occur?

25. Where do nuclear reactions take place in an atom?

26. Suppose bohrium-272 undergoes beta decay. The daughter isotope then also undergoes beta decay. What is the final product?

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*Option 6: Consumer Connection, p. 81*

ADD HALF-LIFE PROBLEMS AND QUESTIONS ABOUT RANKING THE MASS OF THE SUBATOMIC PARTICLES